PANEL

Challenges in Future Internet

Environmental Complexity

More than 27.000 drill wells abandoned in the Mexican Gulf

Tens of thousands of satellites particles lost in space

Trillions of things, under the IoT umbrella

Freedom of speech and anonymous procedures

My phone device;
- more than 250 functions;
- I am using a very few... 3-4

Internet

+
   House surveillance via Internet
   Skype
   Web

   Now, new Internet!
   Who needs it?!
   Do we really need it!?

?

Society, Internet, Future Internet

Content-driven and context-driven features

Network neutrality

User-provided networking

Self-managing systems

Panelists

- **Expert Panelists:**

Eugen Borcoci, University 'Politehnica' Bucharest, Romania

Alex Galis, University College London, UK
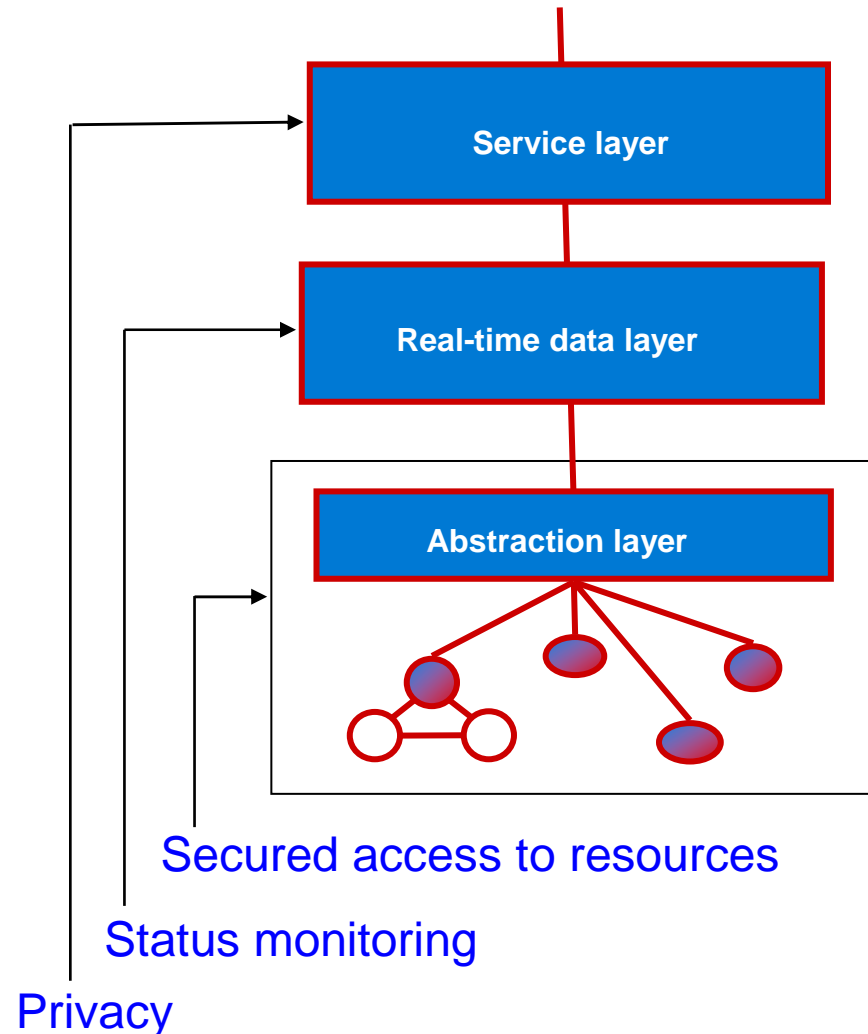
Aljosa Pasic, Atos Origin, Spain

Alessandro Bogliolo, University of Urbino, Italy

Vladimir Sulc, MICRORISC s.r.o., Czech Republic

Shifting our targets…

- **What is so special about "Physical + virtual blending"?**

- **Me and my circumstances**

- **End-to-End Open System for developing and operating thing-based services :**

  - From things/objects (sensors) to applications
  - From application to things/objects (actuators)
  - Intelligence, control, business logic…
  - How to handle identity in the shared service environments (e.g. cloud)
  - Separating authentication, authorization and attribution concerns in an intelligent yet efficient way
  - Moving profile data around (attribute exchange)

Atos Origin™

Service layer

Real-time data layer

Abstraction layer

Secured access to resources

Status monitoring

Privacy

» **Policy/strategy:** Calanda miracle
  » Do not (always) trust "official version"…and "neutral experts/consultants"

» **Business:** Black Swan
  » Do not trust historic data and statistics…

» **Architectural:** Dopamine effect
  » Do not trust humans

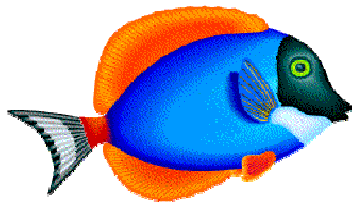» **Implementation:** Epistemic arrogance
  » Do not trust yourself

» **Privacy: What is in my password?**
  » Dynamicity, data aggregation

» **Trust: Can you lend me some money?**
  » Context

» **Identity:** I do not know if I am a dog
  » Multiple identity and their lifecycle across "planes" in NoN

» **Resilience:** Distributed Denial of Traffic
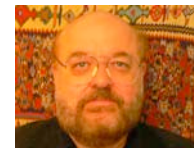 » FI as a critical infrastructure
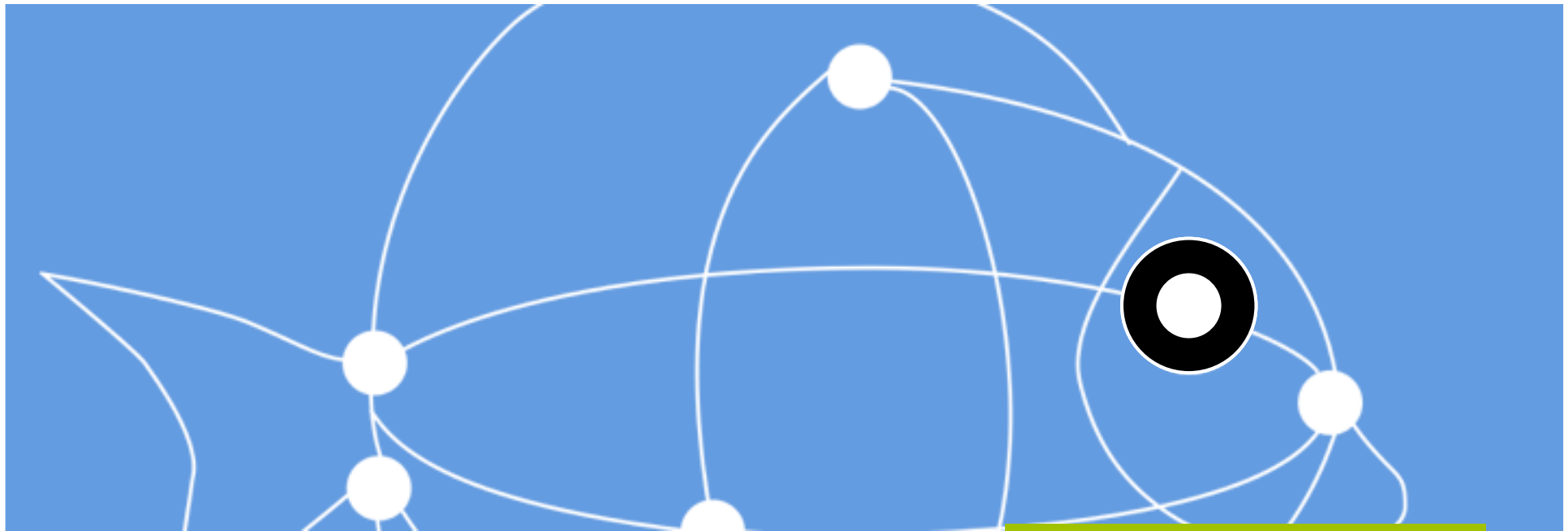
Thank you

FACING TECHNOLOGICAL CHALLENGES TOGETHER
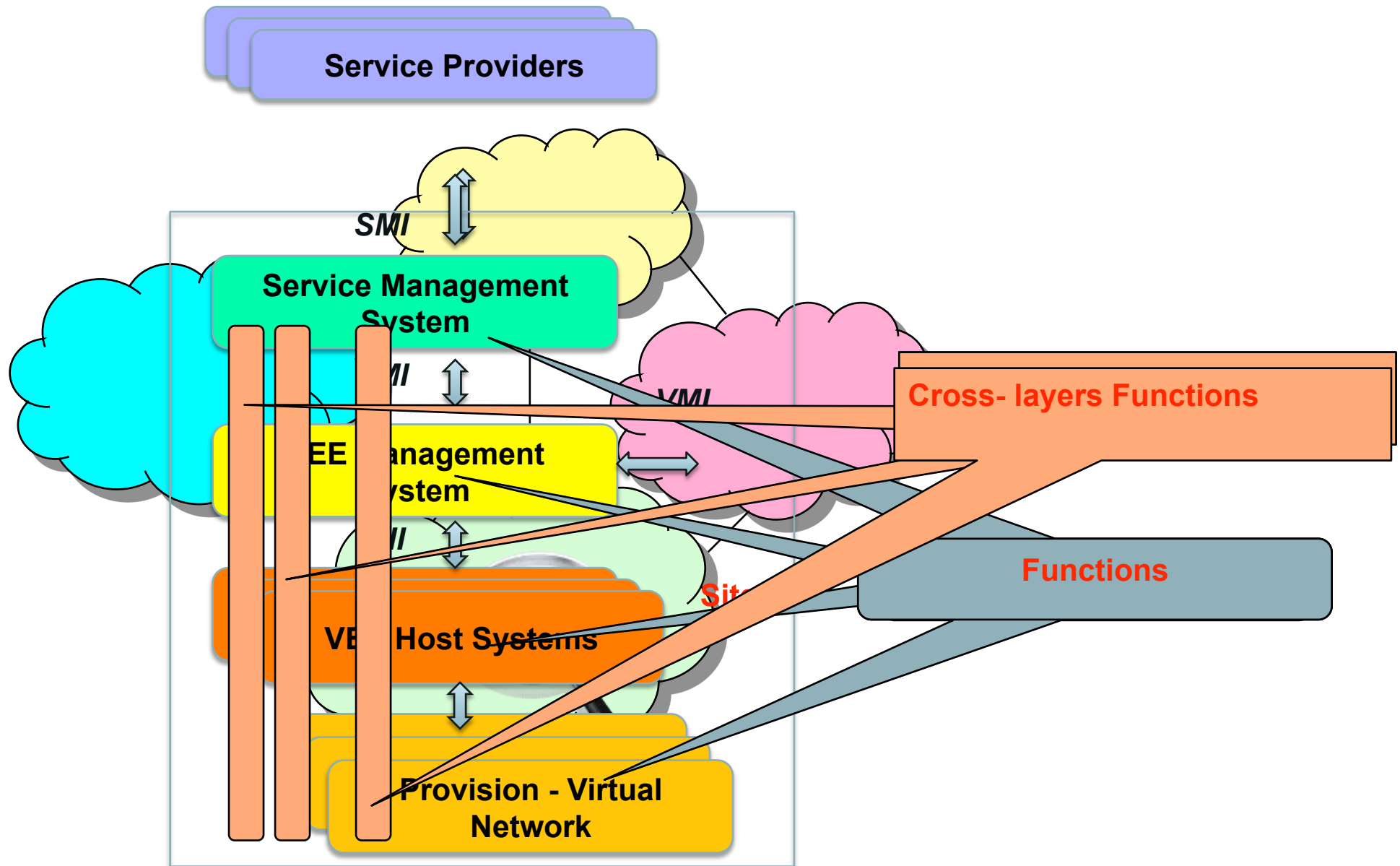**Aljosa Pasic (Atos Origin)**
`aljosa.pasic@atosorigin.com`

Service Providers

SMI

Service Management System

SMI

Cross- layers Functions

VMI

EE Management System

Functions

VMI

Site

VE Host Systems

Provision - Virtual Network

- Virtual Networks Infrastructure

- Virtual Host Infrastructure

- Autonomic management including closed control loops

- Separation
  - SC providers lease resources on pay-per-use basis but do not expose infrastructure details to customers or partners
  - SC consumers use leased resources without exposing details of their applications to providers

- Isolation
  - SC consumers need mechanisms and warranties that their applications are isolated from others that are being hosted in the same infrastructure

- Elasticity
  - SC providers should automatically adjust the resources allocated to a particular application according to "elasticity rules" provided by SC consumer

- Federation
  - To overcome the finite amount of resources available locally, SC providers should be able to collaborate among themselves and share their resources

- Trust / Security
  - The mechanisms to build trust between SC consumers and SC providers and between SC providers among themselves is crucial for the success of SC as the computing paradigm

- Business Orientation
  - Proper support for SLAs to ensure QoS is needed before business application can move to the cloud

Tsunami of Clouds - Why now ?

- Fast penetration of virtualization technology for servers
  - General purpose & specialist virtual machines that can do anything
  - Virtual Private Networks easy set-up
  - Virtualisation of Networks & Servers
  - Virtual appliances
- Fast adoption of Software as a Service
- Substantial Economic value through sharing resources

Panel
Challenges in Future Internet
Content-Aware Networking, …

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NETWARE Conference, July 19-23, Venice/Mestre

CONTENTS

1. Content Aware Networking(CAN), Content Centric Networking (CCN) - versus network neutrality
2. CAN, CCN
3. CAN example: ALICANTE project

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Future Internet Challenges

- **What should be the better development way?**
  - **evolution? or clean slate approach? or something in the middle?**
  - **Source:** Petri Mahönen, Project Coordinator, EIFFEL, RWTH Aachen University" **Evolved Internet Future for European Leadership (EIFFEL)", FI Conference, Bled, 2008**
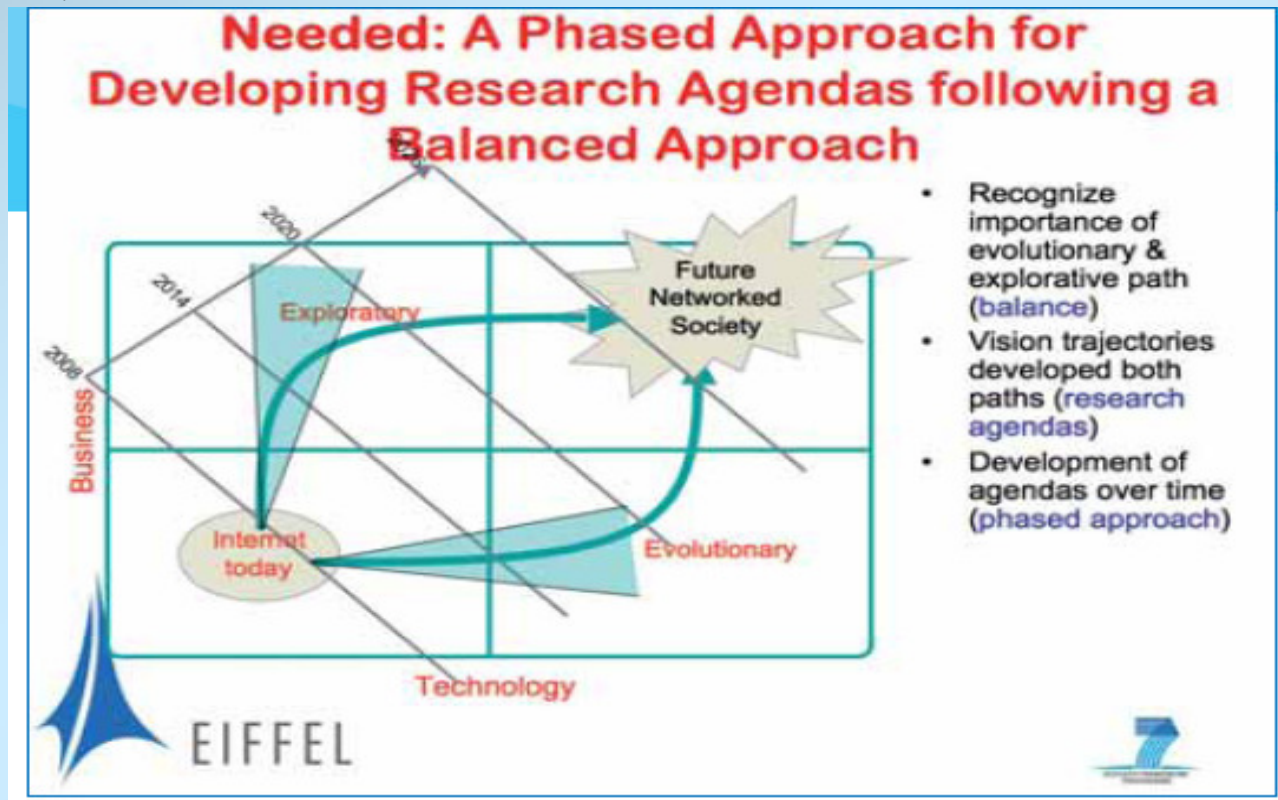
1. CAN/CCN- versus network neutrality

- **Network neutrality-** hot topics in discussion related to FI
  - Socio-economical aspects
  - Technical implications
  - Actions in the courts (FCC / companies (e.g. ComCast))

- Traditional Internet: no traffic type discrimination
- Still a lot of people wants this to continue (users, P2P SPs, etc.)

- However
  - ISPs/operators seem to have different opinions
    - Overload created by some applications (E.g. P2P)
    - Want to offer QoS guaranteed – payment based
    - Different security levels are needed
    - ….
  - Current and future Internet: more and more content/service oriented
  - This will forward to "no more network neutrality"

1. CAN/CCN- versus network neutrality

- Approaches:

- Best effort
- Qos-based virtual splitting
- VPNs + QoS, security, …
- Content aware networks (CAN)/
  - Recent extension: content centric networks
- Service aware networking
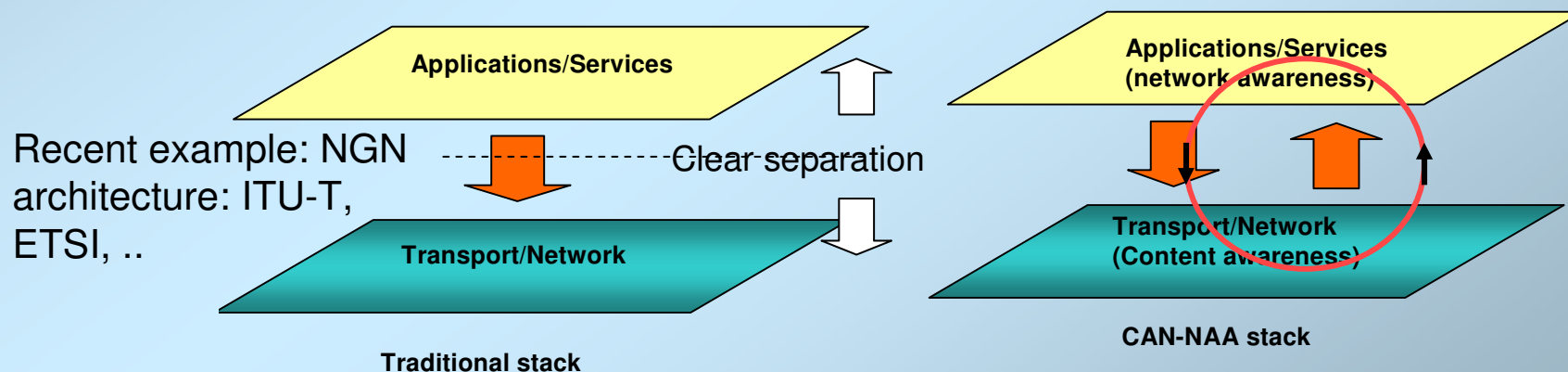- Application aware networking

  - and

- Network aware Applications

- CAN:
  - special processing (routing/forwarding, QoS, security, filtering, caching, etc.)of packet flows
  - based on content-type information (extracted fom the packets, metadata or signalling- obtained)
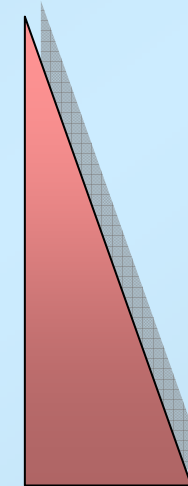
Degree of Network awareness on upper layer information

2. Content Aware Networking

- **Content-Aware Network (CAN) and Network Aware Application (NAA) - Concepts**

  - Question: can one enable better interactions (content-network) but still preserving the architecture modularity?

  - CAN : adjusting network resource allocation based on limited understanding of the nature of the content

  - NAA: network-aware content processing : adjusting the way contents are processed and distributed based on limited understanding of the network condition

Recent example: NGN architecture: ITU-T, ETSI, ..

Applications/Services

Clear separation

Transport/Network

Traditional stack

Applications/Services (network awareness)

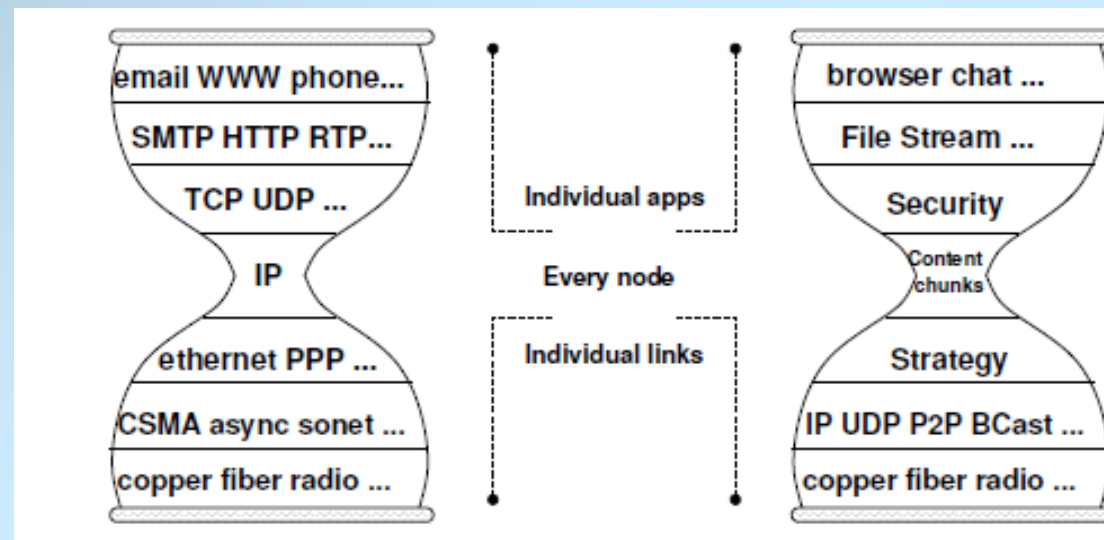Transport/Network (Content awareness)

CAN-NAA stack

2. Content Centric Networking

CCN : transformation of the traditional network stack from IP to chunks of named content

CCN proposes to treats content as a primitive – *decoupling location* from *identity, security and access,* and *retrieving content by name*

Traditional
TCP/IP stack

CCN

Source: Van Jacobson Diana K. Smetters James D. Thornton Michael F. Plass, Nicholas H. Briggs Rebecca L. Braynard, Networking Named Content, Palo Alto Research Center, Palo Alto, CA, October 2009

2. CAN, CCN

- **CAN/CCN : pros and cons**
  - Pros
    - Adapted to the current characteristics of the FI from the services point of view (content and service orientation)
    - More flexible (policies applicable for different functions)
    - Decoupling identity location
    - Better security
    - Implementable : seamlessly or revolutionary-style
      - based on network virtualisations and overlays (achievable in parallel Internet planes)
    - .....

  - Cons
    - No more network neutrality
    - Destroy the traditional TCP/IP stack layering concepts (partially)
    - Significantly increase of the network nodes complexity (speed problems in routers)
    - No more – traditional concept : intelligence at the edge and network: simple, stupid, but flexible
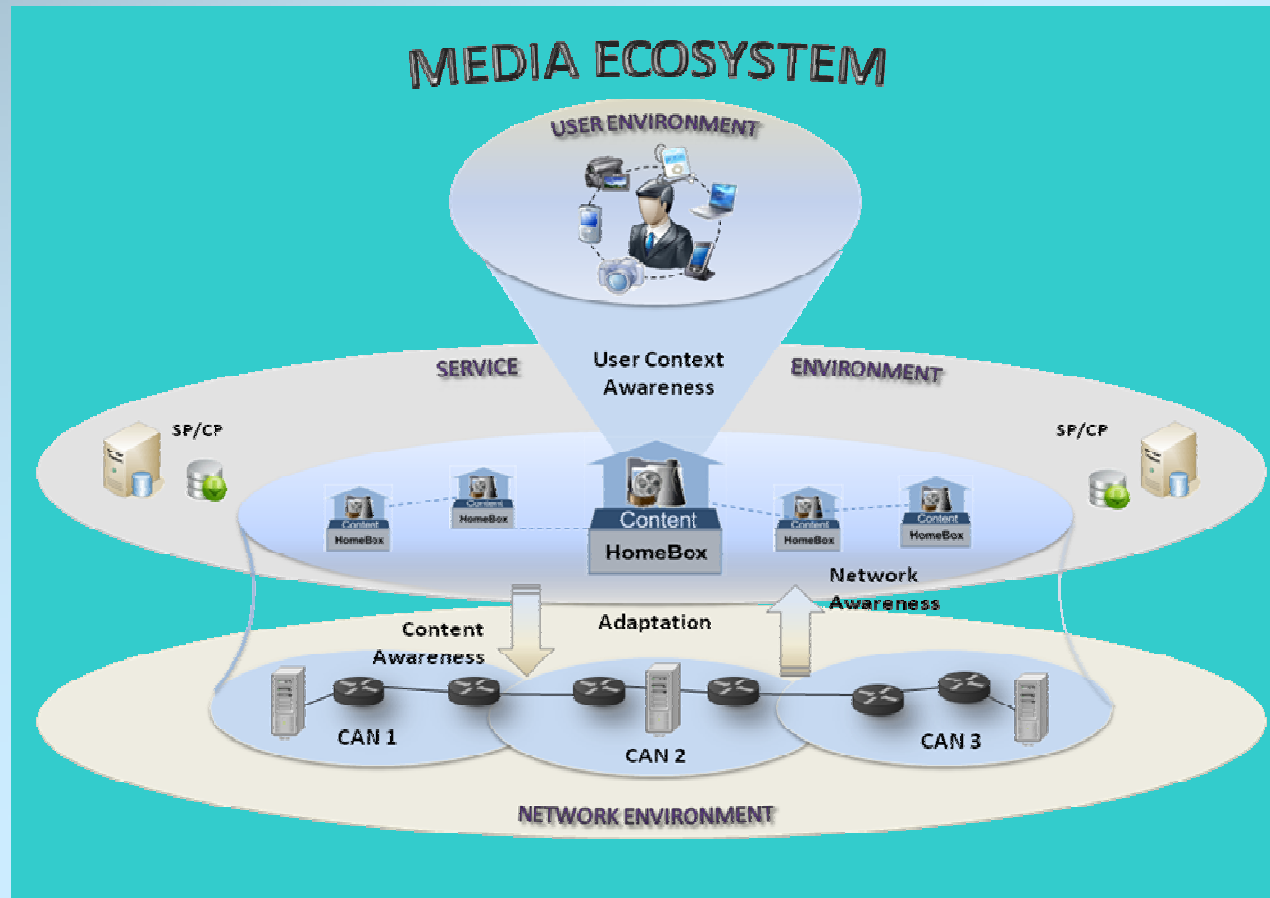   - .....

3. CAN architecture example: ALICANTE project

- **ALICANTE, 2010-2013, FP& Integrated Project (IP): MediA Ecosystem Deployment Through Ubiquitous Content-Aware Network Environment-** *FI oriented project, 17 partners*

- Applying new concepts (Future Internet – oriented) of
-
    - **Content Aware Networking (CAN)**
    - **Network Aware Application (NAA)**

- novel virtual Content-Aware Network (CAN) layer
    - as a part of a full layered architecture
    - focused, but not limited to, on multimedia distribution with Quality of Services (QoS) assurance

- Flexible cooperation between
    - Providers/operators and end-users,
    - users access services/content, being consumers/providers
    - Business model: EU (CC, CP), CP, SP, NP, VCANP

- **ALICANTE-** High level architectural view

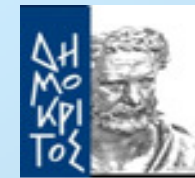Thank you!

Backup slides

Architecture examples: ALICANTE project

■**ALICANTE, 2010-2013, Integrated Project (IP): MediA Ecosystem Deployment Through Ubiquitous Content-Aware Network Environment-** *FI oriented project*

   ALICANTE Partners

Architecture examples: ALICANTE project

Overall Architecture

- **User Env**
- **Service Env**
- **HB-layer**
- **CAN layer**
- **Infrastructure layer**